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Recent photometry of symbiotic stars - XII*

A. Skopal[1,**], **M. Vaňko**[1], **T. Pribulla**[1], **D. Chochol**[1], **E. Semkov**[2], **M. Wolf**[3°], and **A. Jones**[4]

[1] Astronomical Institute, Slovak Academy of Sciences, 059 60 Tatranská Lomnica, Slovakia
[2] Institute of Astronomy, Bulgarian Academy of Sciences, Tsarigradsko shose Blvd. 72, Sofia 1784, Bulgaria
[3] Astronomical Institute, Charles University Prague, CZ-180 00 Praha 8, V Holešovičkách 2, The Czech Republic
[4] Carter Observatory, PO Box 2909, Wellington 1, New Zealand

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We present new photometric observations of 15 symbiotic stars covering their last orbital cycle(s) from 2003.9 to 2007.2. We obtained our data by both classical photoelectric and CCD photometry. Main results are: EG And brightened by ~ 0.3 mag in U from 2003. A $\sim$0.5 mag deep primary minimum developed in the U light curve (LC) at the end of 2006. Z And continues its recent activity that began during the 2000 autumn. A new small outburst started in summer of 2004 with the peak U-magnitude of ~ 9.2. During the spring of 2006 the star entered a massive outburst. It reached its historical maximum at $U \sim 8.0$ in 2006 July. AE Ara erupted in 2006 February with $\Delta m_{\rm vis} \sim 1.2$ mag. BF Cyg entered a new active stage in 2006 August. A brightness maximum ($U \sim 9.4$) was measured during 2006 September. CH Cyg persists in a quiescent phase. During 2006 June – December a ~ 2 mag decline in all colours was measured. CI Cyg started a new active phase during 2006 May – June. After 31 years it erupted by about 2 mag in U. TX CVn maintains a bright stage with $U \sim 10.5$ from 2003. AG Dra entered a new major outburst in 2006 June. It reached its maximum at $U \sim 8.0$ in 2006 September. AR Pav persists at a low level of the activity. AG Peg's LC profile varies markedly during different orbital cycles. AX Per continues its quiescent phase.

1 Introduction

Symbiotic stars are long-period ($P_{\rm orb} \sim 1-3$ years) interacting binary systems consisting of a late-type giant and a hot compact star accreting from the giant's wind. This process generates a very hot ($T_{\rm h} \approx 10^5$ K) and luminous ($L_{\rm h} \approx 10^2 - 10^4\,L_{\odot}$) source of radiation that ionizes a fraction of the neutral wind from the giant giving rise to nebular emission. As a result the observed spectrum of symbiotic stars composes from three basic components of radiation – two stellar and one nebular. Throughout the optical their contributions rival each other, producing the composite spectrum, whose colour indices differ significantly from those of standard stars. In addition, they are different for individual objects and variable due to activity and/or the orbital phase (cf. models SED in Skopal 2005). Therefore the LCs of symbiotic binaries bear a great deal of information about properties of the radiative sources in the system. Photometric monitoring is important to complement other multifrequency observations, mainly during outbursts, to improve our understanding of the observed phenomena (e.g. Sokoloski 2003).

In this paper we present results of our long-term monitoring programme of photometric observations of selected symbiotic stars, originally launched by Hric & Skopal (1989). It continues the work of Skopal et al. (2004, hereafter S+04) by collecting new data obtained during the period 2003 December to 2007 January. Their acquisition and reductions are introduced in Sect. 2. In Sect. 3 we note the most interesting features of the LCs that deserve further investigation. The results are presented in Tables 1–18 and Figs. 1–12.

2 Observations and reductions

Observations made at the Skalnaté Pleso (hereafter SP in Tables), Stará Lesná (G2 pavilion) and the Rozhen Observatory with the Schmidt telescope (R) were already described by S+04. Further details about the observation procedure were described by Hric et al. (1991). Other UBV photoelectric observations were obtained with the modular photometer utilizing a Hamamatsu EA1516 photomultiplier on the 0.5-m telescope at the Sutherland site of the South Africa Astronomical Observatory (SAAO) during two weeks in April and May 2004 and September 2005. The photoelectric measurements were done in the UBV filters of the Johnson's photometric system with a 20 second integration time. Observations were reduced to the Cousins E-region standard system (Menzies et al. 1989) and corrected for differential extinction using the reduction program HEC 22 rel. 14 (Harmanec & Horn 1998). Observations of Draco C-1 in the

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* Tables 1–18 are also available in electronic form at http://www.astro.sk/~astrskop/

** Corresponding author: e-mail: skopal@ta3.sk

° Visiting Astronomer, South African Astronomical Observatory

standard Johnson-Cousins system were made with the photometric AT-200 CCD camera (1024×1024 px, pixel size: 24×24 μm, scale: 0.33 arcsec/px, field: 5.6×5.6 arcmin) on the 2-m telescope at the Rozhen Observatory. Additional BVR_CI_C CCD photometry was obtained with the 0.5-m telescope at the Stará Lesná Observatory (G1 pavilion). The SBIG ST10 MXE CCD camera with the chip 2184×1472 pixels was mounted at the Newtonian focus. The size of the pixel is 6.8 μm and the scale 0.56″/pixel. All frames were dark-subtracted, flat-fielded and corrected for cosmic rays. Other details of the CCD photometric reduction were described by Parimucha & Vaňko (2005).

In addition, visual magnitude estimates of AE Ara, RW Hya and AR Pav were obtained by one of us (AJ) with a private 12".5 f/5 reflector. A comparison between V magnitudes and corresponding visual estimates suggests their uncertainties to be within about 0.2 mag for brighter objects (RW Hya, AR Pav) and 0.3 mag for AE Ara during quiescence ($m_{\rm vis} \gtrsim 13$ mag).

We measured our targets with respect to the same standard stars as in our previous papers (e.g. S+04) if not specified otherwise in Sect. 3. Results are summarized in Tables 1–18 and shown in Figs. 1–12. Each value represents the average of the observations during a night. The maximum internal uncertainty of these night-means is less than 0.05 mag. We verified the absolute photometry by comparing our data with those obtained independently at other observatories.

3 Notes to measured objects

3.1 EG And

EG And is a quiet symbiotic star – no outburst of the Z And type has been recorded to date. Photometric measurements are listed in Table 1 and plotted in Fig. 1. From 2003 the U-LC indicates a brighter stage of EG And by about 0.3 mag. According to the ephemeris of Skopal (1997), a deep primary minimum ($\Delta U \gtrsim 0.5$ mag) was observed during 2006 October to December. By a precise modeling the UV/optical continuum, Skopal (2005) showed that the brightening in the U passband can be caused by an increase in the nebular emission. This could be a result of a transient increase in the mass-loss rate from the giant and thus also the accretion rate and the luminosity of the hot component. Consequently this process increases flux of ionizing photons that gives rise the larger amount of the nebular radiation.

3.2 Z And

Z And is a prototype symbiotic star. The star BD+47 4192 (V = 8.99, $B-V$ = 0.41, $U-B$ = 0.14, $V-R_C$ = 0.10) was used as the comparison for both photoelectric and CCD observations (Tables 2 and 3, Fig. 2). They revealed two new eruptions. The first one started in 2004 July/August and peaked at $V \sim U \sim 9.2$ mag in the mid September with a following re-brightening in 2004 December. Then a slow decrease in the star's brightness was observed to the end of 2005. The second major eruption started during the spring of 2006 and peaked in 2006 July, when the star's brightness reached its historical maximum ($U \sim 8.0$, $V \sim 8.5$) that has ever been recorded by the multicolour photometry. It is of interest to note that spectral features indicating ejection of highly collimated bipolar jets developed during the optical maximum (Skopal & Pribulla 2006). Their evidence in the optical spectra was confirmed by Burmeister & Leedjärv (2007) and Tomov et al. (2007).

3.3 AE Ara

Our observations of AE Ara consists of 488 visual estimates made by one of us (AJ) carried out from 1987 to 2006.9 and photoelectric UBV measurements made on 25/04/2005 at SAAO (JD 2 453 122.596: V = 12.402, $B-V$ = 0.607, $U-B$ = -1.044) We used the standard star HD 317858 (CD-32 12919; V = 9.533, $B-V$ = 0.143, $U-B$ = -0.523). Results are shown in Fig. 3. There is a good agreement between the visual estimates and our photoelectric V magnitude. The very negative $U-B$ index of AE Ara suggests a strong contribution from the nebula at the U passband. During the 2000-05 period a wave-like variation developed in the LC. The time of the best defined minimum at JD 2 453 474±20 agrees (within the uncertainties) with that predicted by the ephemeris of Mikolajewska et al. (2003). Also the time of the previous minimum, we estimated to ≈JD 2 452 710, is close (within 0.07 of the orbital period) to the predicted one. This implies that this light variation was due to the orbital motion (see Mikolajewska et al. 2003 in detail). We note that a large scatter in our visual magnitudes did not allow us to estimate the position of the first minimum more accuratelly.

During 2006 February AE Ara entered a new active phase. Our visual observations revealed a rapid increase in the star's brightness by about 1.2 mag. It peaked at $m_{\rm vis} \sim 11.2$ during April and was gradually decreasing to ~11.8 in 2006 November before its season observational gap.

3.4 BF Cyg

The resulting night-means of the BF Cyg brightness are in Table 4. Figure 4 shows its UBV LCs covering the last 3 orbital cycles. The maximum between 2004.5 and 2005.5 was complex in profile. First a 0.5 mag increase with respect to values from previous cycles was observed during the second half of 2004. An additional brightening to U ~10.5 mag was observed in the spring of 2005. The following minimum at JD 2 453 705±12 was by ~0.5 mag brighter than those observed previously. In 2006 August the LC revealed an eruption with the peak U-magnitude of ~9.4 during the following September. The active phase continues with a slow fading to our last observations at the end of 2006. We note that a similar profile of the LC was also observed during the 1987-

89 period, prior to the 1989 outburst (cf. Fig. 2 of Skopal et al. 1997).

3.5 CH Cyg

Our new photometry of CH Cyg is listed in Table 5. Figure 5 shows LCs from the last 1998-00 activity. From the beginning of 2000 CH Cyg persists in a quiescent phase at rather bright magnitudes ($V = 7 \div 8$, $B = 8.7 \div 9.4$ and $U \approx 10$ or less). The LCs display a wave-like 750÷770-day periodic variation, more pronounced in V, whereas in U the brightness only fluctuated around 10 from about 2003. This suggests that mainly a giant star in the system is responsible for such behaviour. This type of the LC profile developed during each previous post-outburst stage, in 1970 and 1987 (see Fig. 1 of Eyres et al. 2002). During the 2006 June – December period the LCs showed a 2 mag decline in all colours ($\Delta U \sim 1.8$, $\Delta B \sim 2.3$, $\Delta V \sim 2.5$ mag).

3.6 CI Cyg

Photometric measurements of CI Cyg are introduced in Tables 6 and 7 and depicted in Fig. 6. The wave-like variation along the orbital motion indicates a quiescent phase. Such the behaviour developed in 1985, about 10 years after the last outburst in 1975 (cf. Dmitrienko 2000), and continued until the spring of 2006, when a new eruption was detected. A pre-outburst activity was indicated during the recent 2003-06 cycle when the U star's brightness of the 2005-maximum was by about 0.4 mag higher than that of the previous one (Fig. 6). Additional variations were recorded in the V and (in part) B-band LCs. They are probably caused by the red giant whose light dominates these passbands during quiescence (see Fig. 10 in Skopal 2005).

During the 2006 May – June period CI Cyg started its new active phase, when brightened by $\Delta U \sim 2$ mag, $\Delta B \sim 1.2$ mag and $\Delta V \sim 1$ mag.

3.7 V1329 Cyg

Observations of V1329 Cyg (HBV 475) are given in Table 8.

3.8 TX CVn

Table 9 and Fig. 7 summarize photometric measurements of TX CVn. From 2003 the system persists at a higher level of activity with $U \sim 10.5$. Sometimes during the brighter stages, the U-LC shows minima placed at the inferior conjunction of the cool giant (according to the ephemeris of Kenyon & Garcia 1989 for a circular orbit; thick arrows in Fig. 8). However, in some cases no minima were detected in spite of a sufficient coverage of the corresponding part of the LC (crosses in Fig. 8). Another peculiarity concerns to the minima width. The minima are too broad than to be explained by the eclipse of simple stellar photospheres (e.g. $t_3 - t_2 \approx 0.2\,P_{\rm orb}$). This effect deserves further investigation.

3.9 AG Dra

Our measurements of AG Dra are summarized in Tables 10 and 11 and plotted in Fig. 8. The stars "a" ($\alpha_{2000} = 16^{\rm h}03^{\rm m}25^{\rm s}$, $\delta_{2000} = 66°37'31''$) and "b" ($\alpha_{2000} = 16^{\rm h}02^{\rm m}54^{\rm s}$, $\delta_{2000} = 66°41'34''$) as denoted by Montagni et al. (1996) were used as comparison stars for our CCD measurements. We measured their U, B, V magnitudes with respect to our photoelectric standard BD+67°925 (a: $V = 10.456\pm0.005$, $B = 11.007\pm0.008$, $U = 11.059\pm0.012$; b: $V = 11.112\pm0.007$, $B = 11.858\pm0.011$, $U = 12.057\pm0.015$). These magnitudes agree within uncertainties with those measured by Henden & Munari (2006). The LCs show flares, maxima of which repeat with a period of approximately 1 year. During these events the colour index $U - B < 0$, whereas during quiescence we observed $U - B \geq 0$ (Fig. 8). This suggests a significant increase of the nebular component of radiation during active phases.

In 2006 June AG Dra began a massive outburst that is similar in profile, but stronger in brightness, to that from 1980-82. It reached the brightness maximum during 2006 September ($U \sim 8.0$) and afterwards was declining gradually to $U \sim 9$ mag in spring of 2007. With the analogy to the 1980-82 active phase, the second eruption could be expected during the summer of 2007.

3.10 Draco C–1

B, V, $R_{\rm C}$, $I_{\rm C}$ magnitudes of Draco C–1 are in Table 12. We used the standard stars from Henden & Munari (2000). There are 12 calibrated stars in the field of Draco C−1 (12×12 arcmin). The stars No. 4, 7, 9, 11 and 12, which were within the field of our 2-m telescope, were selected to calibrate the Draco C-1 measurements.

3.11 RW Hya

The UBV measurements of RW Hya were carried out at SAAO between 2004 April 22 and May 02. Magnitudes are summarized in Table 13 and shown in Fig. 9 together with those published previously by S+04. To compare the available data, which were obtained within a large time period (from 1990 to 2004), we plotted them against the orbital phase. We used the ephemeris for the inferior conjunction of the giant given by the solution of spectroscopic orbit as published by Schild et al. (1996).

3.12 SY Mus

The UBV measurements of SY Mus are listed in Table 14. Observations were carried out at the SAAO on 2004 April. The star HD 100264 (SAO 251442; $V = 8.679$, $B - V = 0.149$, $U - B = -0.153$) was used as a comparison star.

3.13 AR Pav

The UBV measurements of AR Pav are listed in Table 15. Stars CD-66 2195 (GSC 09080-01017: $V = 9.997$, $B - V =$

0.254, $U - B = 0.164$) and HD 269743 (CPD-66 331: $V = 10.514$, $B - V = 0.781$, $U - B = 0.378$) were used as standard stars. Figure 10 shows the recent evolution in the visual LC (from 1998.4 to December 2006), which corresponds to a low stage of the AR Pav activity. Compared are also our *UBV* measurements. The very good agreement between the visual estimates and photoelectric *V* magnitudes suggests that variations in the visual LC with $\Delta m \gtrsim 0.2$ reflect real changes. Below we point some interesting features in the LC:

(i) A 100÷150-day periodic variation developed between epochs 69 and 70. This type of variability occurred sometimes during low levels of the activity. Skopal et al. (2000) ascribed it to pulsations of the red giant in the system.

(ii) A gradual decrease in the AR Pav activity is suggested by a slow decline in the *U*-band brightness. In 1999.6 we observed $U - V < 0$, while in 2004.3 $U - V > 0$, which reflects a decline of the nebular emission and thus also a decrease in the flux of the ionizing photons resulting probably from a temperature decrease of the hot source.

(iii) Positions of the recent two minima, Min(69) = JD 2 452966 ± 2 and Min(70) = JD 2 453573.3 ± 0.7, differ by 607.3 ± 2.1 days that is by 2.8 days larger then the orbital period ($P_{\rm orb}$ = 604.5 days). We ascribe this difference to a strongly variable size, geometry and radiation of the eclipsing object as already noted by Bruch et al. (1994).

(iv) Mid-points of all the minima from the low state of the activity (E = 66 to 70) precede those predicted by the linear ephemeris determined by 4÷65 epochs, which confirms a continuous decrease of the orbital period found by Skopal et al. (2000).

3.14 AG Peg

Photometric observations of AG Peg are summarized in Table 16 and depicted in Fig. 11. The LCs show variations in the profile from cycle to cycle. Most pronounced are different levels of maxima/minima and their shaping. For example, the minimum around JD 2 452 900 was flat for about 0.26 of the orbital period. Such behaviour suggests that the symbiotic nebula is variable in both the shape and the emissivity. The former is given by a different projection of the optically thick part of the nebula into the line of sight (Skopal 2001), while the latter can reflect variation in the flux of ionizing photons.

The variation in the *V*-band LC is probably in part caused by the giant's semiregular variability, because the light contribution from the giant dominates the SED from *V* (cf. Fig. 20 of Skopal 2005).

3.15 AX Per

The recent measurements of AX Per are introduced in Tables 17 and 18 and showed in Fig. 12. Our CCD frames from the pavilion G1 distinguished two optical components of the star BD+53°340 (α_{2000} = 01$^{\rm h}$36$^{\rm m}$37.98$^{\rm s}$, δ_{2000} = 54°14′41.8″) in *UBV* filters. The brighter one (denoted as *a*) was used as a comparison star for our CCD measurements in Table 18 (*a*: $V = 9.56$, $B - V = 1.45$ and *b*: $V = 12.44$, $B - V = 0.53$). The wave-like profile of the LC as a function of the orbital phase reflects a quiescent phase. However, the profile is not simple sinusoidal. Variations during different orbital cycles are evident.

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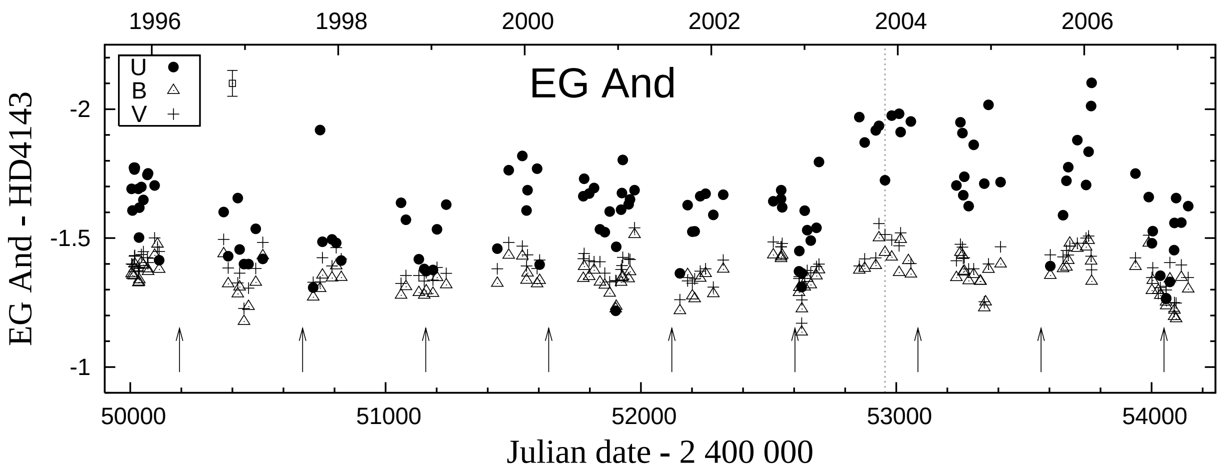

Fig. 1 Differential *UBV* LCs of EG And. Arrows mark positions of the primary minima (ephemeris of Skopal 1997). New data (Table 1) are plotted to the right of the vertical dotted line. The error bar (top left) represents a maximum uncertainty in *U*.

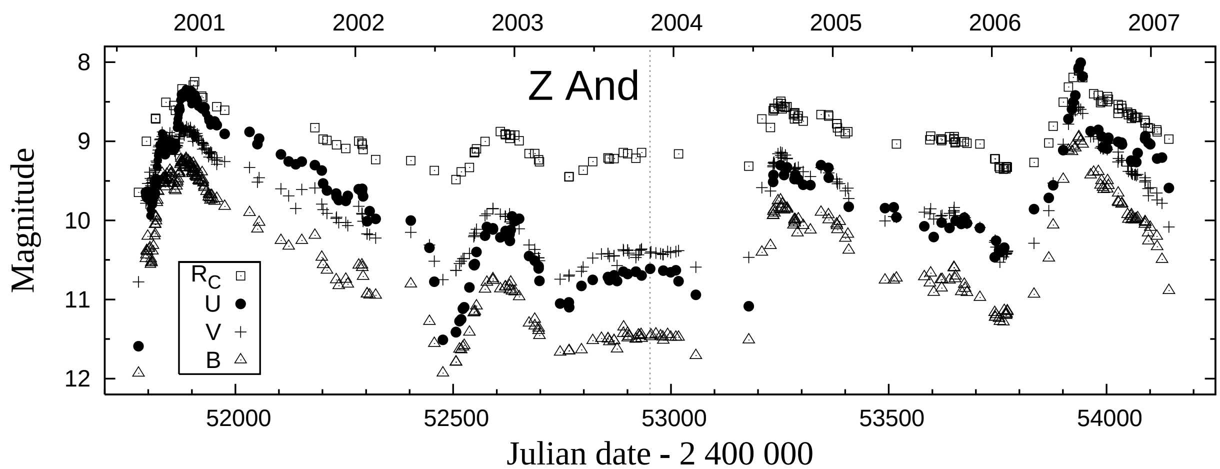

Fig. 2 The *UBVR*$_C$ LCs of Z And covering its recent active phase from 2000. New data are from Tables 2 and 3. Compared are data of Tomov et al. (2004) and Sokoloski et al. (2006) around the 2000-01 maximum.

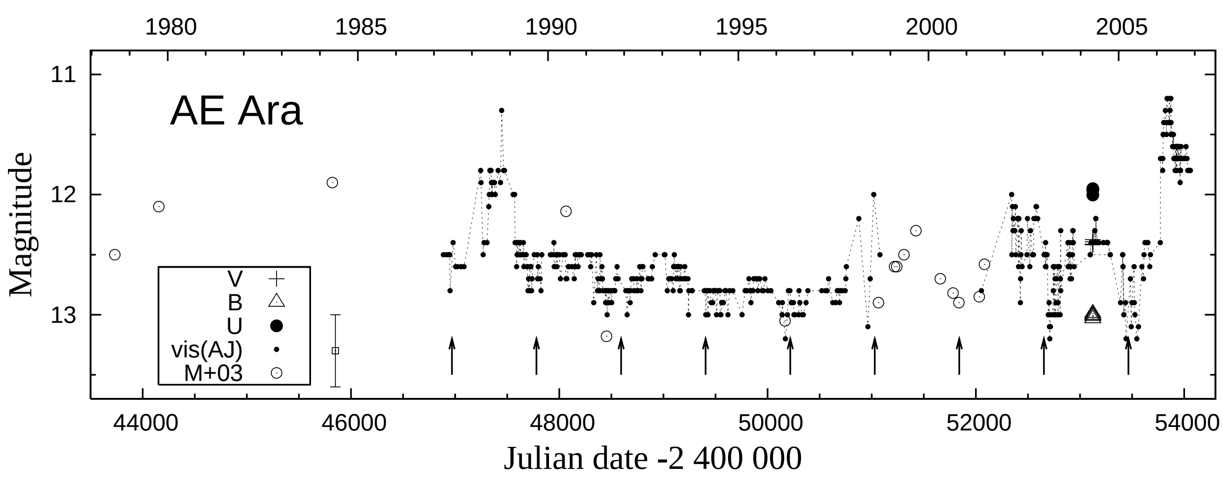

Fig. 3 Our visual LC and *UBV* magnitudes of AE Ara from Sect. 3.3 compiled with those published by Mikolajewska et al. (2003) (open circles). Arrows denote positions of the primary minima according to their ephemeris. New outburst began in 2006 February. The error bar represents a maximum uncertainty of faintest visual estimates.

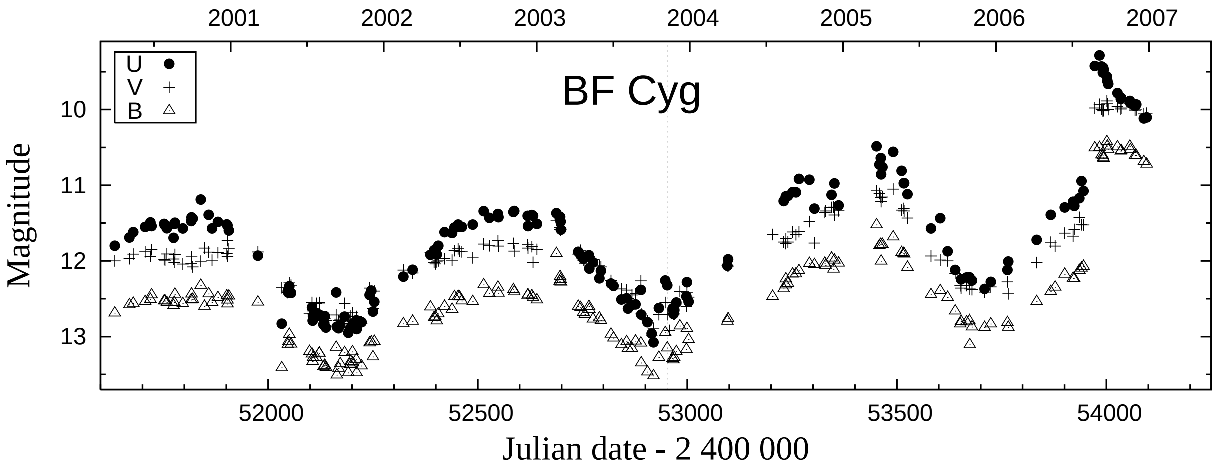

Fig. 4 The *UBV* LCs of BF Cyg revealed a new active stage from 2006 August. Compared are data from Yudin et al. (2005) to 2004.6.

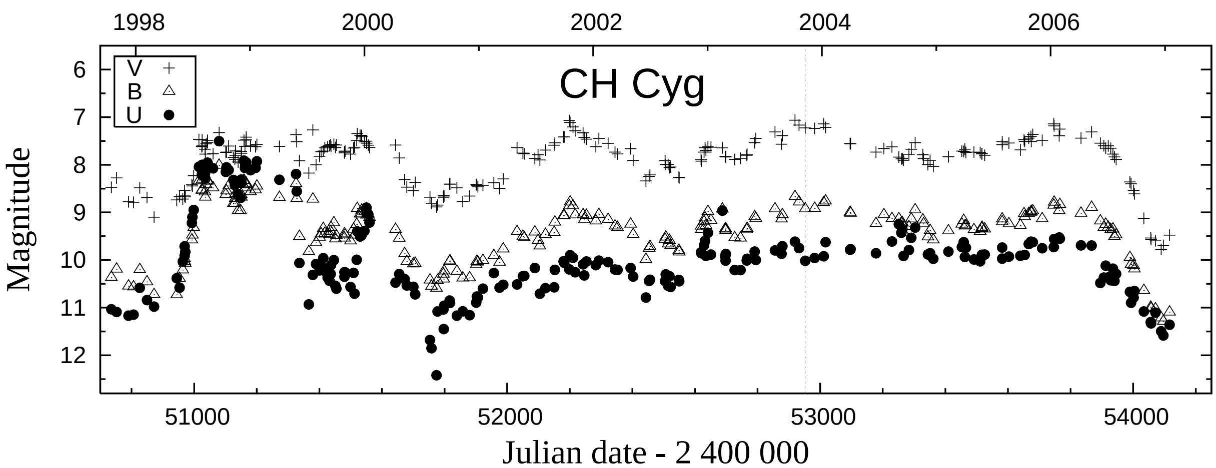

Fig. 5 The *UBV* LCs of CH Cyg.

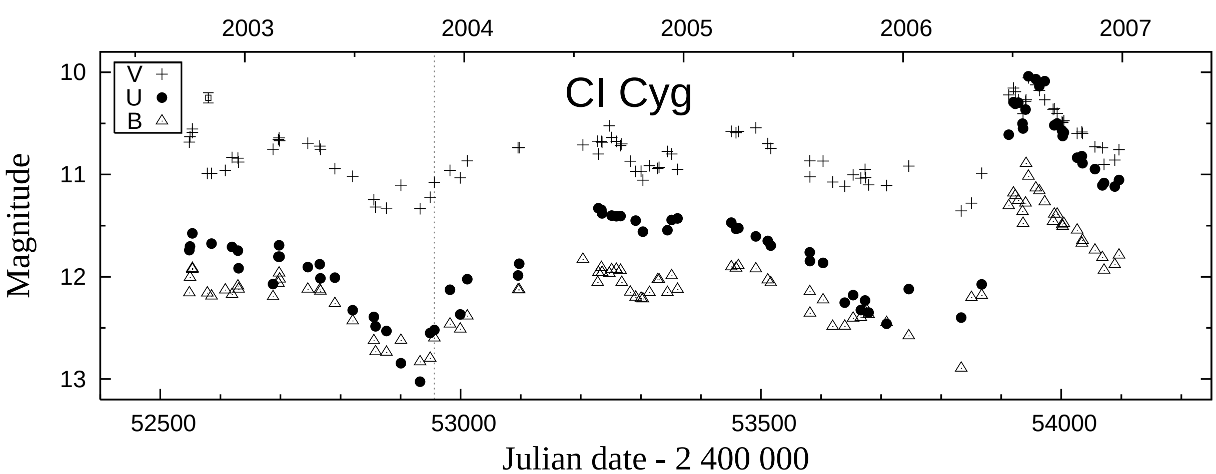

Fig. 6 The *UBV* LCs of CI Cyg revealed a new active stage that began in 2006 June. Maximum uncertainty of individual points is nearly within their size (compare the error bar at the top-left corner).

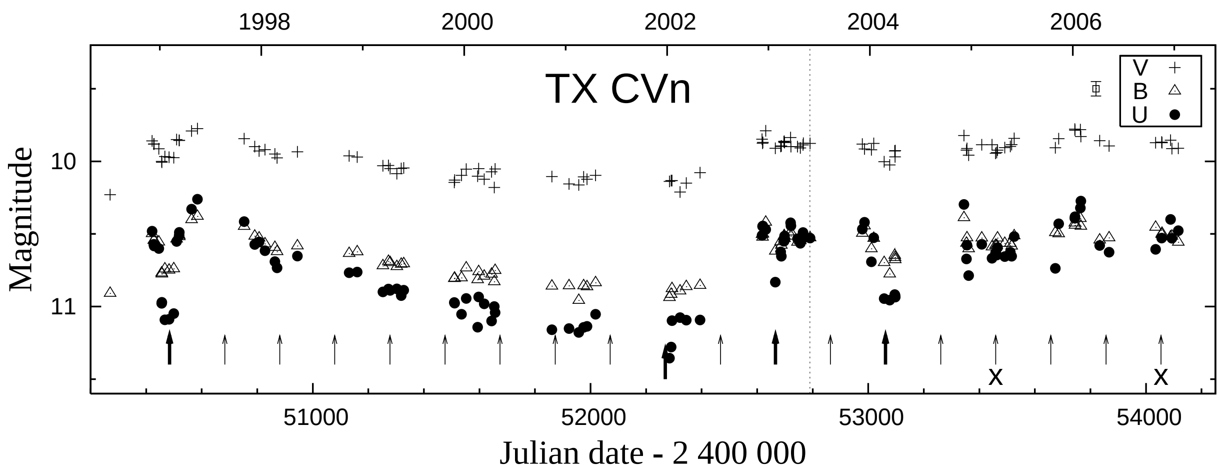

Fig. 7 The *UBV* LCs of TX CVn. Arrows denote positions of the inferior conjunction of the giant (Kenyon & Garcia 1989). Thick arrows mark the appearance of minima, while " × " mark their disappearance during the brighter stages (Sect. 3.8).

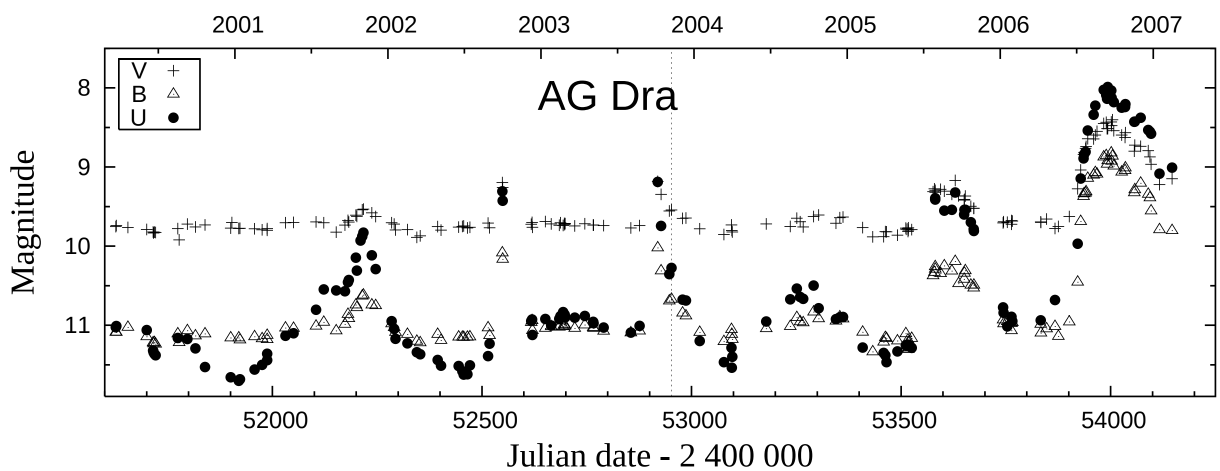

Fig. 8 The *UBV* LCs of AG Dra. New massive outburst started in 2006 June. The data were complemented with those of Leedjärv et al. (2004).

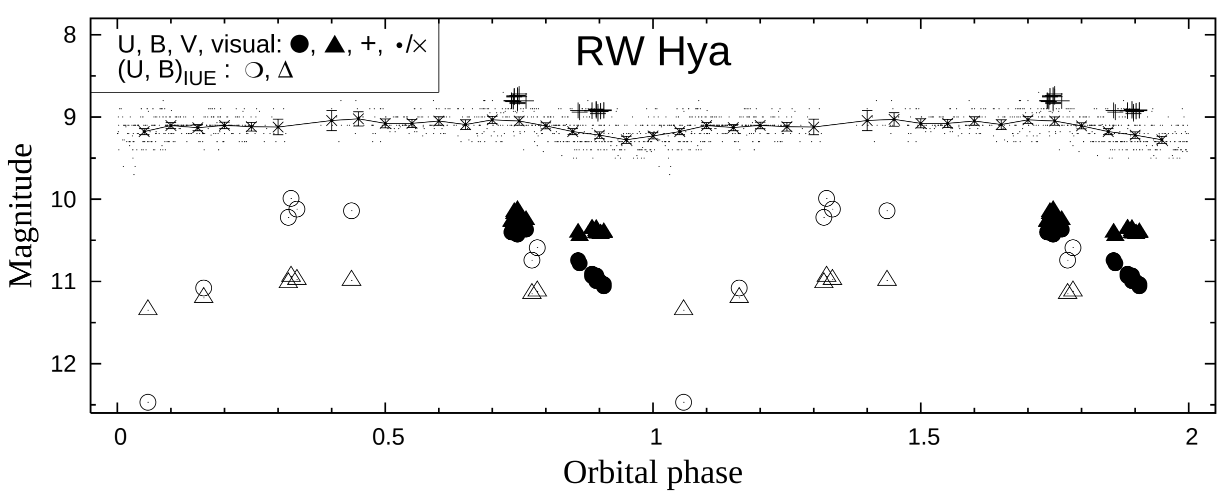

Fig. 9 Our visual LC and *UBV* measurements of RW Hya from Table 13 compiled with those published by S+04 and Munari et al. (1992).

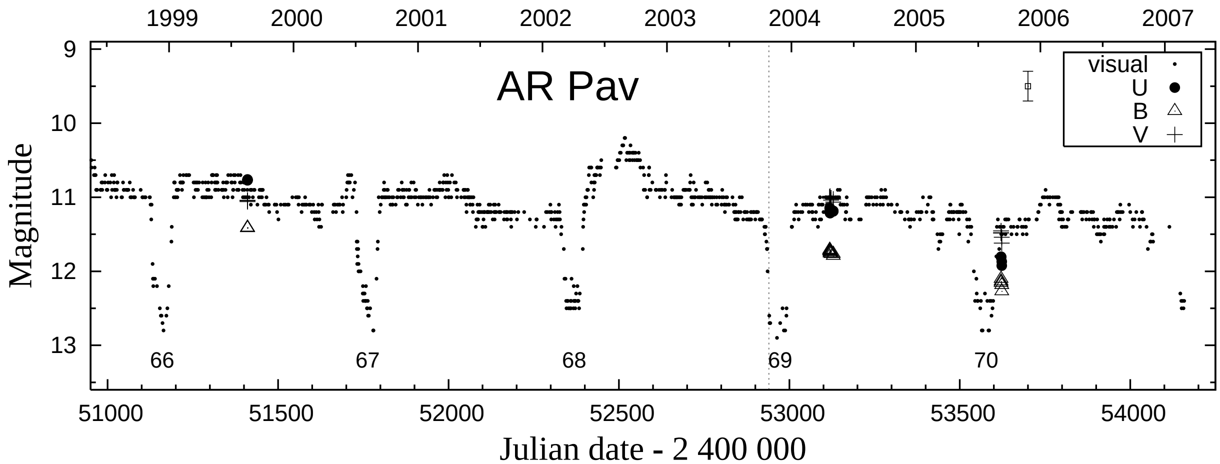

Fig. 10 Our visual LC covering a low stage of activity from 1998.4. New *UBV* points are from Table 15. Numbers 66 – 70 denote the mid-points of eclipses predicted by their linear ephemeris derived by Skopal et al. (2000). The error bar represents a maximum uncertainty of visual estimates.

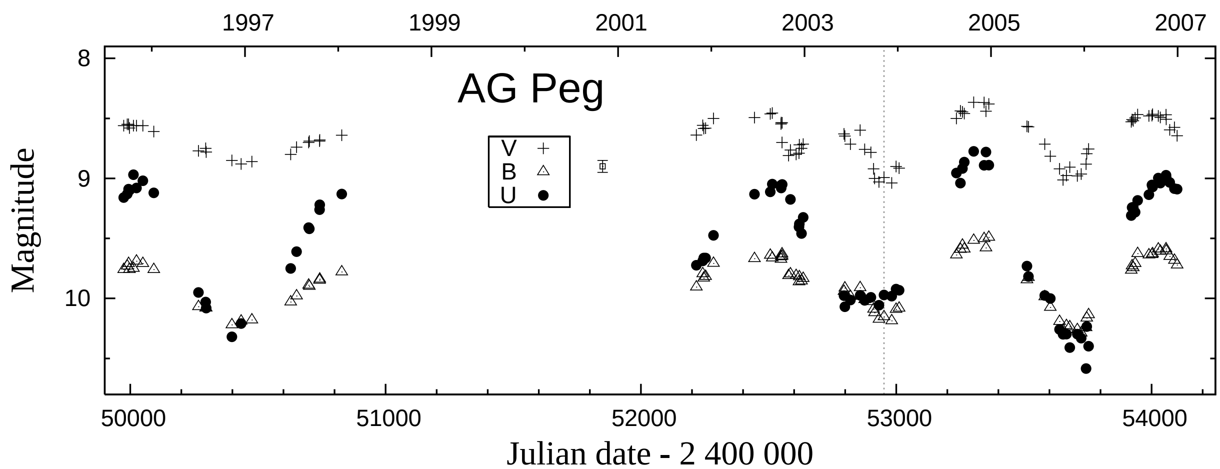

Fig. 11 *UBV* LCs of AG Peg. Data to 1998 are from Tomov & Tomova (1998).

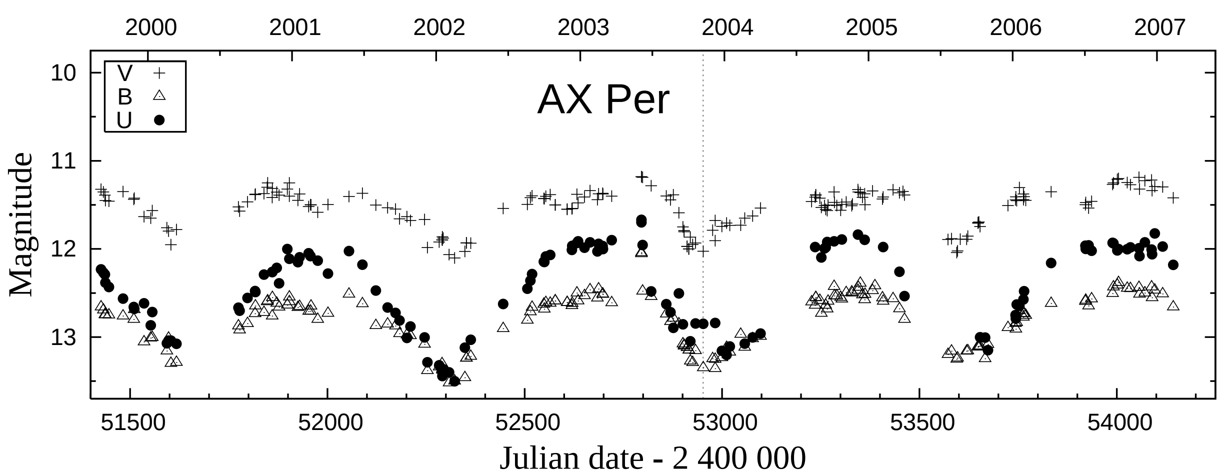

Fig. 12 *UBV* LCs of AX Per. New data are in Tables 17 and 18.

Table 1 U, B, V, R_C observations of EG And.

Date	JD 24...	ΔU	B	V	ΔR_C	Obs
Nov 12, 03	52956.229	-1.724	8.718	7.049	–	G2
Dec 8, 03	52982.309	-1.975	8.736	7.071	–	G2
Jan 6, 04	53011.312	-1.982	8.796	7.093	–	G2
Jan 12, 04	53017.286	-1.911	8.668	7.043	-1.636	SP
Feb 11, 04	53047.194	–	8.75	7.17	–	R
Feb 21, 04	53057.256	-1.952	8.802	7.162	–	G2
Aug 18, 04	53235.505	-1.704	8.816	7.151	–	G2
Sep 3, 04	53251.553	-1.949	8.718	7.087	-1.556	SP
Sep 11, 04	53259.509	-1.907	8.729	7.098	-1.530	SP
Sep 14, 04	53262.564	-1.666	8.794	7.142	-1.517	SP
Sep 17, 04	53266.434	-1.738	8.791	7.139	–	G2
Oct 5, 04	53283.560	-1.624	8.828	7.183	-1.477	SP
Oct 25, 04	53303.609	-1.862	8.804	7.182	-1.544	SP
Nov 18, 04	53328.169	–	8.83	7.24	–	R
Nov 20, 04	53330.410	–	8.83	7.23	–	R
Dec 4, 04	53344.432	-1.711	8.933	7.310	-1.375	SP
Dec 10, 04	53350.317	–	8.91	7.29	–	R
Dec 21, 04	53361.400	-2.017	8.784	7.163	-1.517	SP
Feb 6, 05	53408.257	-1.717	8.763	7.097	–	G2
Aug 20, 05	53603.469	-1.391	8.807	7.128	–	G2
Oct 9, 05	53653.481	-1.589	8.781	7.136	-1.537	SP
Oct 23, 05	53666.512	-1.722	8.775	7.111	-1.560	SP
Oct 29, 05	53673.445	-1.775	8.749	7.129	-1.539	SP
Nov 4, 05	53679.479	–	8.682	7.094	-1.551	SP
Dec 4, 05	53709.413	-1.880	8.702	7.083	-1.570	SP
Jan 7, 06	53743.421	-1.706	8.697	7.063	-1.619	SP
Jan 17, 06	53753.290	-1.835	8.672	7.055	-1.571	SP
Jan 27, 06	53763.252	-2.012	8.752	7.133	-1.548	SP
Jan 29, 06	53765.304	-2.102	8.830	7.186	-1.485	SP
Jul 20, 06	53936.527	-1.750	8.773	7.140	-1.530	SP
Sep 10, 06	53988.589	-1.659	8.682	7.052	-1.610	SP
Sep 22, 06	54001.499	-1.480	8.866	7.216	-1.462	SP
Sep 25, 06	54004.441	-1.527	8.827	7.178	-1.483	SP
Oct 18, 06	54026.617	–	8.866	7.278	-1.401	SP
Oct 25, 06	54034.450	-1.354	8.885	7.255	-1.423	SP
Nov 16, 06	54056.400	-1.264	8.911	7.250	-1.421	SP
Nov 17, 06	54057.401	-1.267	8.925	7.264	-1.380	SP
Dec 1, 06	54071.396	-1.330	8.821	7.158	-1.507	SP
Dec 18, 06	54088.388	-1.453	8.967	7.347	-1.359	SP
Dec 19, 06	54089.386	-1.559	8.942	7.313	-1.380	SP
Dec 26, 06	54096.292	-1.655	8.975	7.315	–	G2
Jan 15, 07	54116.269	-1.560	8.815	7.167	-1.505	SP
Feb 11, 07	54143.254	-1.624	8.860	7.216	-1.448	SP

Table 2 U, B, V, R_C observations of Z And.

Date	JD 24...	U	B	V	R_C	Obs
Nov 8, 03	52952.222	10.612	11.472	10.414	–	G2
Dec 8, 03	52982.293	10.636	11.516	10.432	–	G2
Dec 25, 03	52999.275	10.656	11.478	10.408	–	G2
Jan 6, 04	53011.276	10.630	11.477	10.396	–	G2
Jan 12, 04	53017.246	10.769	11.479	10.383	9.160	SP
Feb 21, 04	53057.229	10.940	11.710	10.590	–	G2
Jun 22, 04	53178.514	11.086	11.513	10.467	9.315	SP
Aug 16, 04	53234.433	9.514	9.941	9.323	–	G2
Aug 17, 04	53235.477	9.426	9.888	9.273	–	G2
Sep 3, 04	53251.513	9.301	9.744	9.137	8.555	SP
Sep 10, 04	53259.471	9.427	9.871	9.216	8.564	SP
Sep 14, 04	53262.516	9.352	9.844	9.174	8.570	SP
Sep 17, 04	53266.400	9.330	9.859	9.214	–	G2
Oct 5, 04	53283.505	9.478	9.989	9.385	8.717	SP
Oct 6, 04	53285.489	9.425	9.993	9.339	–	G2
Oct 13, 04	53292.229	9.482	9.982	9.329	8.679	SP
Oct 25, 04	53303.503	9.550	10.065	9.385	8.745	SP
Nov 10, 04	53320.196	9.555	10.123	9.445	–	G2
Dec 4, 04	53344.388	9.301	9.899	9.334	8.662	SP
Dec 21, 04	53361.299	9.335	9.930	9.348	8.666	SP
Dec 22, 04	53362.249	9.460	9.993	9.398	8.682	SP
Feb 6, 05	53408.223	9.828	10.377	9.725	–	G2
May 1, 05	53491.544	9.844	10.755	10.006	–	G2
May 20, 05	53511.492	9.835	10.757	9.951	–	G2
May 26, 05	53517.465	9.960	10.730	9.959	9.033	SP
Jul 29, 05	53581.481	10.074	10.714	9.897	–	G2
Aug 20, 05	53603.412	10.211	10.910	9.982	–	G2
Sep 7, 05	53621.421	10.027	10.856	9.982	8.992	SP
Sep 26, 05	53639.557	10.096	10.755	9.911	8.943	SP
Oct 9, 05	53653.443	10.005	10.706	9.941	9.006	SP
Oct 22, 05	53666.473	10.044	10.903	9.993	9.007	SP
Oct 29, 05	53673.445	9.965	10.809	9.969	9.007	SP
Nov 4, 05	53679.421	10.037	10.913	10.036	9.025	SP
Nov 4, 05	53679.421	10.037	10.913	10.036	9.025	SP
Dec 4, 05	53709.375	10.095	10.975	10.090	9.034	SP
Jan 7, 06	53743.375	10.465	11.166	10.277	9.220	SP
Jan 10, 06	53746.268	10.258	11.193	10.338	–	G2
Jan 17, 06	53753.251	10.378	11.240	10.412	9.320	SP
Jan 19, 06	53755.243	10.401	11.278	10.528	9.342	SP
Jan 27, 06	53763.207	10.375	11.284	10.460	9.353	SP
Jan 29, 06	53765.269	10.345	11.141	10.426	9.346	SP
Apr 8, 06	53833.572	9.857	10.935	10.288	9.268	SP
May 12, 06	53867.546	9.716	10.478	9.876	9.020	SP
May 22, 06	53877.518	9.556	10.059	9.529	8.809	SP
Jun 13, 06	53900.493	9.112	9.481	9.038	8.504	SP
Jun 26, 06	53912.515	8.718	9.115	8.784	8.314	SP
Jul 3, 06	53920.453	8.594	9.132	8.665	–	G2
Jul 7, 06	53923.520	8.506	9.064	8.617	8.192	SP
Jul 11, 06	53928.440	8.421	9.084	8.613	–	G2
Jul 19, 06	53935.522	8.080	8.960	8.565	8.109	SP
Jul 19, 06	53936.462	8.065	8.943	8.576	8.103	SP
Jul 24, 06	53940.525	8.006	9.000	8.596	–	G2
Jul 28, 06	53945.442	8.181	9.038	8.648	8.196	SP
Aug 15, 06	53963.377	8.873	9.426	8.942	–	G2
Sep 2, 06	53981.347	8.855	9.385	8.971	8.421	SP
Sep 9, 06	53988.390	8.938	9.499	9.065	8.492	SP

Table 2 Continued

Date	JD 24...	U	B	V	R_C	Obs
Sep 13, 06	53991.528	9.076	9.584	9.094	8.494	SP
Sep 14, 06	53993.361	9.072	9.611	9.092	–	G2
Sep 22, 06	54001.462	9.093	9.604	9.103	8.499	SP
Sep 23, 06	54002.329	8.989	9.498	9.028	8.434	SP
Sep 25, 06	54004.403	8.955	9.560	9.020	8.469	SP
Oct 18, 06	54026.528	9.006	9.655	9.135	8.534	SP
Oct 25, 06	54034.411	9.016	9.797	9.242	8.547	SP
Oct 26, 06	54035.379	9.040	9.789	9.239	8.583	SP
Nov 16, 06	54056.351	9.245	9.950	9.379	8.652	SP
Nov 17, 06	54057.363	9.259	9.993	9.405	8.655	SP
Nov 28, 06	54068.394	9.264	9.980	9.434	8.694	SP
Dec 1, 06	54071.356	9.149	9.969	9.418	8.699	SP
Dec 18, 06	54088.383	8.967	10.017	9.461	8.768	SP
Dec 19, 06	54089.351	8.934	10.027	9.497	8.767	SP
Dec 26, 06	54096.264	9.019	10.261	9.687	–	G2
Dec 30, 06	54100.270	9.039	10.090	9.585	8.837	SP
Jan 15, 07	54116.231	9.219	10.334	9.741	8.880	SP
Jan 26, 07	54127.217	9.205	10.495	9.783	–	G2
Feb 11, 07	54143.218	9.591	10.888	10.082	8.972	SP

Table 3 B, V, R_C, I_C CCD observations of Z And.

Date	JD 24...	B	V	R_C	ΔI_C	Obs
Feb 16, 03	52687.328	11.250	10.418	–	–	G1
Jul 19, 03	52840.467	11.492	10.424	–	-1.416	G1
Sep 8, 03	52891.399	11.349	10.385	–	-1.519	G1
Sep 18, 03	52900.581	11.428	10.380	–	-1.568	G1
Sep 21, 03	52903.573	11.470	10.415	–	-1.592	G1
Oct 12, 03	52925.438	11.450	10.436	–	-1.580	G1
Oct 15, 03	52928.439	11.459	10.377	–	-1.374	G1
Oct 18, 03	52931.383	11.445	10.371	–	-1.392	G1
Nov 10, 03	52954.297	11.451	10.398	–	-1.418	G1
Nov 21, 03	52965.293	11.438	10.412	–	-1.383	G1
Dec 2, 03	52976.273	11.461	10.421	–	-1.433	G1
Dec 7, 03	52981.330	11.476	10.431	–	-1.421	G1
Dec 18, 03	52992.200	11.445	10.393	–	-1.434	G1
Jul 22, 04	53208.545	10.404	9.585	8.718	-1.084	G1
Aug 11, 04	53228.545	10.318	9.629	8.826	-1.007	G1
Aug 17, 04	53234.609	9.936	9.307	8.613	-1.117	G1
Aug 19, 04	53236.612	9.869	9.263	8.582	-1.123	G1
Aug 20, 04	53237.535	9.909	9.285	8.594	-1.114	G1
Aug 28, 04	53245.600	9.754	9.157	8.519	-1.162	G1
Sep 3, 04	53252.291	9.840	9.179	8.494	-1.188	G1
Sep 4, 04	53253.288	9.857	9.202	8.524	-1.170	G1
Sep 6, 04	53255.449	9.796	9.147	8.591	-1.153	G1
Sep 17, 04	53266.394	9.848	9.220	8.563	-1.179	G1
Oct 2, 04	53281.301	10.060	9.390	8.662	-1.103	G1
Oct 4, 04	53283.374	10.011	9.348	8.647	-1.109	G1
Oct 5, 04	53284.278	10.035	9.355	8.639	-1.115	G1
Oct 11, 04	53290.455	10.159	9.462	8.710	-1.104	G1
Jan 9, 05	53380.239	10.047	9.478	8.776	-0.994	G1
Jan 10, 05	53381.222	10.069	9.513	8.780	-1.015	G1
Jan 11, 05	53382.295	10.119	9.537	8.829	-0.970	G1
Jan 16, 05	53387.266	10.014	9.535	8.876	-0.919	G1
Jan 29, 05	53400.213	10.227	9.626	8.902	-0.926	G1
Feb 4, 05	53406.290	10.176	9.593	8.878	-0.954	G1
Jul 20, 05	53572.391	10.606	–	8.982	-0.912	G1
Aug 11, 05	53594.481	10.792	9.915	8.980	-0.934	G1
Aug 13, 05	53596.486	10.667	9.853	8.935	-0.864	G1
Sep 5, 05	53619.438	10.752	9.944	8.970	-0.910	G1
Sep 8, 05	53622.417	10.747	9.937	8.977	-0.835	G1
Oct 5, 05	53649.470	10.597	9.875	8.969	-0.876	G1
Oct 5, 05	53649.488	10.599	9.893	8.976	-0.913	G1
Oct 6, 05	53650.477	10.600	9.836	8.941	-0.943	G1
Oct 8, 05	53652.414	10.739	9.938	9.019	-0.868	G1
Oct 31, 05	53675.355	10.860	9.965	9.996	-0.908	G1
Jan 8, 06	53744.286	11.226	10.255	9.223	-0.748	G1
Jan 8, 06	53744.298	11.226	10.253	9.223	-0.741	G1
Jan 25, 06	53761.187	11.264	–	–	–	G1
Jan 27, 06	53763.233	11.259	–	–	–	G1
Feb 2, 06	53769.227	11.202	10.428	9.347	-0.680	G1
Feb 2, 06	53769.238	11.200	10.418	9.347	-0.676	G1
Feb 3, 06	53770.212	11.187	10.415	9.329	-0.675	G1
Feb 3, 06	53770.232	11.185	10.414	9.320	-0.675	G1
Feb 3, 06	53770.253	11.183	10.411	9.320	-0.687	G1
Feb 5, 06	53772.223	11.144	10.386	9.326	-0.685	G1
Feb 5, 06	53772.253	11.156	10.394	9.326	-0.681	G1
Sep 7, 06	53986.382	9.557	9.085	8.511	-1.131	G1
Oct 17, 06	54026.229	9.766	9.262	8.648	-1.068	G1
Oct 18, 06	54027.295	9.778	9.217	8.590	-1.048	G1
Nov 8, 06	54048.420	9.928	9.314	8.633	-1.143	G1
Nov 10, 06	54050.227	9.987	9.379	8.664	-1.112	G1
Dec 25, 06	54095.270	10.160	9.599	8.827	-0.957	G1
Jan 14, 07	54115.260	10.201	9.654	8.855	-0.924	G1

Table 4 U, B, V, R_C observations of BF Cyg.

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 08, 03	52952.247	12.322	13.152	12.709	–	G2
Dec 8, 03	52982.206	–	12.861	12.403	–	G2
Dec 25, 03	52999.185	12.281	12.894	12.422	–	G2
Mar 31, 04	53095.594	12.064	12.798	12.064	4.275	SP
Apr 1, 04	53097.483	11.980	12.765	12.069	4.246	SP
Jul 16, 04	53203.483	–	12.470	11.650	–	R
Aug 17, 04	53235.365	11.146	12.240	11.706	–	G2
Sep 2, 04	53251.420	11.092	12.175	11.617	3.856	SP
Sep 10, 04	53259.394	11.094	12.173	11.652	3.816	SP
Sep 17, 04	53266.297	10.915	12.131	11.614	–	G2
Oct 12, 04	53291.308	10.927	12.034	11.480	3.759	SP
Nov 18, 04	53328.183	–	12.030	11.360	–	R
Nov 20, 04	53330.184	–	12.060	11.340	–	R
Dec 4, 04	53344.232	11.126	11.964	11.293	3.577	SP
Dec 9, 04	53349.193	–	12.110	11.290	–	R
Dec 11, 04	53351.204	10.975	11.991	11.394	–	G2
Dec 21, 04	53361.180	11.267	12.030	11.338	3.518	SP
Mar 22, 05	53451.606	10.485	11.525	11.074	–	G2
Mar 28, 05	53458.497	10.727	11.800	11.110	3.357	SP
Apr 1, 05	53461.548	10.641	11.781	11.161	–	G2
Apr 2, 05	53462.543	10.856	12.003	11.216	–	G2
Apr 5, 05	53465.542	10.761	11.783	11.155	3.426	SP
Apr 30, 05	53491.469	10.558	11.684	11.052	–	G2
May 20, 05	53511.431	10.810	11.890	11.328	–	G2
May 25, 05	53516.480	10.974	11.902	11.307	3.535	SP
May 26, 05	53517.429	10.972	11.910	11.339	3.530	SP
Jun 4, 05	53525.518	11.117	12.085	11.433	3.641	SP
Jul 29, 05	53581.422	11.571	12.447	11.934	–	G2
Aug 20, 05	53603.362	11.436	12.394	11.989	–	G2
Sep 7, 05	53621.365	11.873	12.483	12.000	4.117	SP
Sep 25, 05	53639.378	12.119	12.664	12.166	4.251	SP
Oct 7, 05	53651.350	–	12.834	12.328	4.453	SP
Oct 9, 05	53653.312	12.243	12.800	12.360	4.460	SP
Oct 22, 05	53666.351	12.219	12.808	12.325	4.419	SP
Oct 29, 05	53673.340	12.216	12.795	12.278	4.412	SP
Oct 30, 05	53674.204	–	13.110	12.370	–	R
Nov 4, 05	53679.225	12.260	12.875	12.380	4.490	SP
Dec 4, 05	53709.183	12.370	12.880	12.412	4.527	SP
Dec 19, 05	53724.189	12.276	12.835	12.343	–	G2
Jan 28, 06	53763.666	12.120	12.817	12.277	4.437	SP
Jan 30, 06	53765.674	12.008	12.879	12.435	4.642	SP
Apr 7, 06	53833.456	11.722	12.538	12.021	4.200	SP
May 11, 06	53867.445	11.392	12.405	11.754	3.913	SP
May 21, 06	53877.484	0.000	12.347	11.804	3.976	SP
Jun 13, 06	53900.412	11.293	12.176	11.633	3.852	SP
Jul 3, 06	53920.426	11.219	12.230	11.672	–	G2
Jul 6, 06	53923.375	11.273	12.237	11.585	3.770	SP
Jul 18, 06	53935.487	11.171	12.125	11.425	3.778	SP
Jul 23, 06	53940.489	10.945	12.098	11.522	–	G2
Jul 28, 06	53945.482	11.075	12.073	11.524	3.761	SP

Table 4 Continued

Date	JD 24...	U	B	V	ΔR_{C}	Obs
Aug 24, 06	53972.321	9.425	10.508	9.980	–	G2
Sep 4, 06	53983.327	9.285	10.503	9.930	–	G2
Sep 9, 06	53988.309	9.431	10.601	9.998	2.627	SP
Sep 12, 06	53991.378	9.511	10.612	10.018	2.660	SP
Sep 13, 06	53992.279	9.447	10.639	10.016	–	G2
Sep 14, 06	53993.314	9.474	10.647	10.012	–	G2
Sep 22, 06	54001.254	9.565	10.425	9.887	2.640	SP
Sep 23, 06	54002.256	9.625	10.483	9.923	2.650	SP
Sep 25, 06	54004.287	9.661	10.531	10.000	2.717	SP
Oct 17, 06	54026.279	9.781	10.495	9.962	2.740	SP
Oct 25, 06	54034.212	9.860	10.550	9.992	2.800	SP
Oct 26, 06	54035.259	9.847	10.543	9.979	2.734	SP
Nov 16, 06	54056.186	9.887	10.486	9.923	2.708	SP
Nov 17, 06	54057.257	9.915	10.532	9.919	2.720	SP
Nov 28, 06	54068.272	9.953	10.607	10.009	2.825	SP
Dec 1, 06	54071.184	9.932	10.609	10.003	2.769	SP
Dec 19, 06	54089.207	10.116	10.690	10.057	2.769	SP
Dec 26, 06	54096.181	10.104	10.723	10.049	–	G2

Table 5 U, B, V, R_C observations of CH Cyg.

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 8, 03	52952.277	10.015	8.928	7.225	–	G2
Dec 8, 03	52982.269	9.956	8.917	7.237	–	G2
Jan 6, 04	53011.233	9.923	8.797	7.141	–	G2
Jan 12, 04	53017.200	9.627	8.763	7.216	-2.667	SP
Mar 31, 04	53095.511	9.783	8.999	7.554	-2.545	SP
Apr 1, 04	53097.398	9.773	9.020	7.561	-2.411	SP
Jun 21, 04	53178.464	9.857	9.237	7.735	-2.211	SP
Jul 16, 04	53203.449	–	9.050	7.660	–	R
Aug 11, 04	53229.377	9.613	9.133	7.623	–	G2
Sep 2, 04	53251.339	9.247	9.136	7.841	-2.073	SP
Sep 10, 04	53259.320	9.428	9.227	7.877	-2.041	SP
Sep 13, 04	53262.472	9.351	9.222	7.870	-2.016	SP
Sep 17, 04	53266.267	9.913	9.431	7.906	–	G2
Oct 4, 04	53283.454	9.791	9.301	7.781	-2.176	SP
Oct 12, 04	53291.325	9.534	9.140	7.673	-2.218	SP
Oct 24, 04	53303.343	9.320	8.949	7.535	-2.304	SP
Nov 18, 04	53328.169	–	9.160	7.790	–	R
Nov 20, 04	53330.167	–	9.240	7.870	–	R
Dec 4, 04	53344.343	9.882	9.515	7.997	-2.028	SP
Dec 11, 04	53351.179	9.857	9.383	7.906	–	G2
Dec 21, 04	53361.254	9.976	9.580	8.032	-2.027	SP
Feb 8, 05	53409.667	9.822	9.390	7.832	–	G2
Mar 23, 05	53452.580	9.728	9.250	7.713	–	G2
Mar 28, 05	53458.455	9.624	9.171	7.719	-2.271	SP
Apr 1, 05	53462.461	9.936	9.288	7.674	–	G2
Apr 4, 05	53465.476	9.741	9.284	7.741	-2.220	SP
Apr 30, 05	53491.400	9.989	9.365	7.733	–	G2
May 20, 05	53511.395	10.027	9.400	7.746	–	G2
May 25, 05	53516.428	9.897	9.342	7.773	-2.191	SP
May 26, 05	53517.389	9.891	9.316	7.764	-2.186	SP
Jun 3, 05	53525.484	9.888	9.352	7.801	-2.192	SP
Jul 29, 05	53581.347	9.972	9.201	7.517	–	G2
Jul 29, 05	53581.416	9.738	9.139	7.579	-2.371	SP
Aug 20, 05	53603.300	9.930	9.240	7.542	–	G2
Sep 25, 05	53639.455	9.910	9.272	7.688	-2.207	SP
Oct 7, 05	53651.285	–	9.030	7.474	-2.456	SP
Oct 9, 05	53653.266	9.892	9.095	7.513	-2.417	SP
Oct 22, 05	53666.308	9.664	9.025	7.440	-2.478	SP
Oct 29, 05	53673.292	9.616	8.998	7.406	-2.510	SP
Oct 30, 05	53674.188	–	8.980	7.510	–	R
Nov 4, 05	53679.373	9.625	8.970	7.363	-2.542	SP
Dec 4, 05	53709.314	9.752	9.135	7.488	-2.438	SP
Jan 10, 06	53746.242	9.728	8.849	7.143	–	G2
Jan 12, 06	53747.696	9.558	8.787	7.184	-2.696	SP
Jan 28, 06	53763.595	9.527	8.967	7.391	-2.553	SP
Jan 30, 06	53765.639	9.551	8.836	7.251	-2.650	SP
Apr 7, 06	53833.407	9.693	9.019	7.443	-2.508	SP
May 11, 06	53867.409	9.696	8.896	7.310	-2.597	SP
Jun 8, 06	53895.356	10.480	9.183	7.548	–	G2
Jun 19, 06	53906.353	10.368	9.314	7.600	–	G2
Jun 25, 06	53912.433	10.119	9.252	7.652	-2.258	SP
Jul 3, 06	53920.360	10.365	9.316	7.602	–	G2
Jul 11, 06	53928.356	10.427	9.360	7.651	–	G2
Jul 18, 06	53935.422	10.183	9.352	7.777	-2.147	SP
Jul 23, 06	53940.405	10.438	9.508	7.835	–	G2

Table 5 Continued

Date	JD 24...	*U*	*B*	*V*	ΔR_C	Obs
Jul 29, 06	53945.516	10.290	9.473	7.890	-2.088	SP
Sep 10, 06	53989.484	10.667	9.950	8.360	-1.585	SP
Sep 14, 06	53993.338	10.899	10.092	8.400	–	G2
Sep 22, 06	54001.346	10.790	10.116	8.542	-1.406	SP
Sep 25, 06	54004.358	10.650	10.190	8.612	-1.348	SP
Oct 25, 06	54034.327	11.080	10.641	9.125	-0.857	SP
Nov 16, 06	54056.316	11.301	10.992	9.539	-0.410	SP
Nov 17, 06	54057.220	11.331	11.022	9.566	-0.393	SP
Dec 1, 06	54071.312	11.105	11.029	9.597	-0.411	SP
Dec 19, 06	54089.281	11.496	11.219	9.777	-0.322	SP
Dec 26, 06	54096.238	11.583	11.289	9.694	–	G2
Jan 15, 07	54116.189	11.360	11.094	9.479	-0.652	SP

Table 6 U, B, V, R_C observations of CI Cyg

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 12, 03	52956.191	12.520	12.599	11.077	–	G2
Dec 8, 03	52982.246	12.127	12.464	10.960	–	G2
Dec 25, 03	52999.241	12.368	12.512	11.032	–	G2
Jan 6, 04	53011.185	12.024	12.384	10.866	–	G2
Mar 31, 04	53095.551	11.987	12.129	10.737	0.826	SP
Apr 2, 04	53097.531	11.873	12.129	10.737	0.788	SP
Jul 16, 04	53203.469	–	11.830	10.710	–	R
Aug 11, 04	53229.410	11.330	11.960	10.800	–	G2
Aug 16, 04	53234.378	11.346	11.911	10.677	–	G2
Aug 17, 04	53235.328	11.380	11.958	10.684	–	G2
Sep 2, 04	53251.380	11.402	11.931	10.638	0.606	SP
Sep 10, 04	53259.358	11.408	11.928	10.677	0.680	SP
Sep 17, 04	53266.329	11.406	11.938	10.718	–	G2
Oct 12, 04	53291.380	11.450	12.200	10.970	0.600	SP
Oct 24, 04	53303.400	11.559	12.217	11.055	0.890	SP
Nov 18, 04	53328.204	–	12.030	10.940	–	R
Nov 20, 04	53330.203	–	12.030	10.930	–	R
Dec 4, 04	53344.276	11.544	12.155	10.774	0.735	SP
Dec 11, 04	53351.230	11.445	11.990	10.799	–	G2
Dec 21, 04	53361.218	11.430	12.124	10.950	0.810	SP
Mar 21, 05	53450.600	11.470	11.904	10.578	–	G2
Mar 29, 05	53458.550	11.531	11.916	10.591	0.576	SP
Apr 2, 05	53462.502	11.525	11.892	10.579	–	G2
May 1, 05	53491.512	11.605	11.923	10.544	–	G2
May 20, 05	53511.462	11.650	12.031	10.697	–	G2
May 26, 05	53516.511	11.695	12.060	10.745	0.757	SP
Jul 29, 05	53581.378	11.761	12.146	10.867	–	G2
Jul 29, 05	53581.495	11.847	12.356	11.023	0.976	SP
Aug 20, 05	53603.383	11.865	12.227	10.868	–	G2
Sep 25, 05	53639.420	12.253	12.484	11.114	1.105	SP
Oct 9, 05	53653.358	12.179	12.406	11.003	0.970	SP
Oct 22, 05	53666.396	12.325	12.400	11.035	1.056	SP
Oct 29, 05	53673.387	12.232	12.342	10.950	0.959	SP
Oct 30, 05	53674.231	–	12.310	11.030	–	R
Nov 4, 05	53679.276	12.350	12.370	11.101	1.014	SP
Dec 4, 05	53709.266	12.460	12.448	11.107	1.040	SP
Jan 10, 06	53746.195	12.120	12.578	10.918	–	G2
Apr 7, 06	53833.499	12.400	12.895	11.356	1.213	SP
May 11, 06	53867.479	12.074	12.182	10.988	1.003	SP
Jun 25, 06	53912.472	10.611	11.307	10.221	0.426	SP
Jul 3, 06	53920.390	10.293	11.181	10.154	–	G2
Jul 6, 06	53923.421	10.308	11.208	10.191	0.382	SP
Jul 11, 06	53928.381	10.298	11.254	10.267	–	G2
Jul 18, 06	53935.457	10.502	11.364	10.343	0.470	SP
Jul 19, 06	53936.395	10.550	11.479	10.406	0.562	SP
Jul 23, 06	53940.443	10.365	11.280	10.284	–	G2
Jul 28, 06	53945.407	10.040	11.018	10.054	0.260	SP
Aug 9, 06	53957.488	10.068	11.133	10.123	0.298	SP
Aug 15, 06	53963.351	10.136	11.160	10.178	–	G2
Aug 24, 06	53972.354	10.087	11.269	10.270	–	G2
Sep 9, 06	53988.475	10.519	11.388	10.357	0.447	SP
Sep 14, 06	53993.285	10.500	11.388	10.402	–	G2
Sep 22, 06	54001.304	10.569	11.494	10.487	0.520	SP
Sep 23, 06	54002.290	10.624	11.509	10.493	0.501	SP
Sep 25, 06	54004.324	10.589	11.480	10.475	0.503	SP
Oct 17, 06	54026.342	10.835	11.545	10.597	0.572	SP
Oct 25, 06	54034.254	10.820	11.672	10.585	0.571	SP
Oct 26, 06	54035.298	10.890	11.644	10.597	0.568	SP
Nov 16, 06	54056.227	10.947	11.739	10.728	0.640	SP
Nov 28, 06	54068.311	11.106	11.814	10.738	0.597	SP
Dec 1, 06	54071.273	11.084	11.937	10.901	0.734	SP
Dec 19, 06	54089.246	11.117	11.883	10.858	0.734	SP
Dec 26, 06	54096.214	11.053	11.788	10.756	–	G2

Table 7 CCD B, V, R_C, I_C observations of CI Cyg.

Date	JD 24...	B	V	ΔR_C	ΔI_C	Obs
Aug 10, 04	53228.325	12.056	10.675	0.578	-0.937	G1†
Aug 29, 04	53247.376	11.967	10.523	0.748	-0.486	G1‡
Sep 19, 04	53268.301	12.056	10.701	0.817	-0.431	G1‡
Oct 3, 04	53282.421	12.151	10.870	0.982	-0.396	G1‡
Oct 21, 04	53300.307	12.210	10.968	1.036	-0.350	G1‡
Nov 4, 04	53314.320	12.155	10.914	1.027	-0.379	G1‡
Sep 5, 05	53619.316	12.486	11.074	0.977	-0.857	G1†
Apr 25, 06	53850.544	12.204	11.280	1.323	-0.241	G1†
Jul 24, 06	53941.413	10.893	10.269	0.595	-0.665	G1†
Sep 7, 06	53986.353	11.459	10.363	0.657	-0.572	G1‡

†CI Cyg - HD226107, ‡CI Cyg - HD226041

Table 8 CCD B and V observations of V1329 Cyg from the Rozhen Observatory

Date	JD 24...	B	V	Obs
Oct 02, 03	52915.371	13.69	13.00	R
Jul 15, 04	53202.495	14.15	13.34	R
Jul 16, 04	53203.499	14.15	13.33	R
Nov 20, 04	53330.216	14.41	13.68	R
Dec 8, 04	53348.199	14.49	13.78	R
Dec 9, 04	53349.212	14.46	13.73	R
Oct 30, 05	53674.246	14.36	13.46	R

Table 9 U, B, V, R_C observations of TX CVn

Date	JD 24...	U	B	V	ΔR_C	Obs
May 30, 03	52790.374	10.529	10.527	9.877	0.106	SP
Dec 5, 03	52978.678	10.467	10.496	9.881	0.050	SP
Dec 13, 03	52986.655	10.420	10.445	9.915	0.147	SP
Jan 6, 04	53011.451	10.692	10.603	9.921	–	G2
Jan 15, 04	53019.584	10.526	10.531	9.877	0.106	SP
Feb 21, 04	53057.322	10.945	10.698	10.003	–	G2
Mar 12, 04	53077.415	10.956	10.777	10.025	0.288	SP
Mar 30, 04	53095.409	10.918	10.648	9.928	0.179	SP
Mar 31, 04	53096.292	10.923	10.663	9.969	0.157	SP
Apr 1, 04	53097.318	10.935	10.678	9.926	0.230	SP
Dec 5, 04	53344.513	10.297	10.388	9.822	0.100	SP
Dec 14, 04	53353.592	10.672	10.564	9.923	0.151	SP
Dec 16, 04	53355.642	10.577	10.527	9.911	0.163	SP
Dec 21, 04	53361.436	10.787	10.603	9.957	0.154	SP
Feb 6, 05	53408.401	10.571	10.529	9.886	–	G2
Mar 15, 05	53445.367	10.667	10.590	9.886	0.190	SP
Mar 28, 05	53458.394	10.630	10.580	9.945	0.177	SP
Apr 1, 05	53462.324	10.646	10.581	9.939	–	G2
Apr 4, 05	53465.317	10.595	10.528	9.923	0.158	SP
Apr 30, 05	53491.327	10.656	10.566	9.905	–	G2
May 20, 05	53511.341	10.626	10.566	9.897	–	G2
May 25, 05	53516.348	10.654	10.584	9.884	0.136	SP
Jun 3, 05	53525.417	10.518	10.514	9.842	0.087	SP
Oct 30, 05	53673.619	10.737	10.492	9.906	0.148	SP
Nov 11, 05	53685.530	10.430	10.500	9.844	0.100	SP
Jan 8, 06	53743.663	10.392	10.425	9.778	0.039	SP
Jan 9, 06	53744.606	10.381	10.440	9.786	0.033	SP
Jan 27, 06	53763.455	10.321	10.394	9.781	0.055	SP
Jan 29, 06	53765.444	10.274	10.447	9.829	0.105	SP
Apr 7, 06	53833.288	10.580	10.542	9.858	0.083	SP
May 11, 06	53867.323	10.626	10.527	9.894	0.123	SP
Oct 26, 06	54034.555	10.606	10.455	9.872	-0.082	SP
Nov 17, 06	54056.561	10.528	10.504	9.867	0.118	SP
Nov 18, 06	54057.535	–	10.496	9.872	0.083	SP
Dec 19, 06	54088.554	10.400	10.520	9.854	0.141	SP
Dec 24, 06	54093.585	10.530	10.516	9.912	0.175	SP
Jan 15, 07	54116.416	10.478	10.558	9.910	0.139	SP

Table 10 U, B, V, R_C observations of AG Dra

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 8, 03	52952.190	10.275	10.673	9.542	–	G2
Dec 5, 03	52978.629	10.677	10.846	9.648	-0.781	SP
Dec 13, 03	52986.601	10.688	10.883	9.644	-0.759	SP
Jan 15, 04	53019.539	11.200	11.090	9.780	-0.640	SP
Mar 12, 04	53077.481	11.466	11.207	9.852	-0.598	SP
Mar 30, 04	53095.467	11.285	11.055	9.731	-0.745	SP
Mar 31, 04	53096.332	11.537	11.117	9.801	-0.557	SP
Apr 1, 04	53097.355	11.398	11.181	9.821	-0.572	SP
Jun 21, 04	53178.420	10.952	11.044	9.720	-0.685	SP
Aug 18, 04	53235.568	10.673	11.017	9.750	–	G2
Sep 2, 04	53251.296	10.536	10.905	9.647	-0.715	SP
Sep 10, 04	53259.278	10.642	10.958	9.691	-0.704	SP
Sep 17, 04	53266.479	10.667	10.970	9.757	–	G2
Oct 12, 04	53291.229	10.498	10.835	9.626	-0.793	SP
Oct 24, 04	53303.457	10.785	10.918	9.606	-0.687	SP
Dec 5, 04	53344.559	10.923	10.948	9.710	-0.708	SP
Dec 14, 04	53353.650	10.900	10.895	9.641	-0.751	SP
Dec 22, 04	53361.513	10.895	10.920	9.632	-0.744	SP
Feb 6, 05	53408.359	11.281	11.088	9.766	–	G2
Mar 28, 05	53458.339	11.350	11.214	9.881	-0.558	SP
Apr 1, 05	53462.365	11.379	11.156	9.817	–	G2
Apr 4, 05	53465.391	11.466	11.170	9.818	-0.586	SP
Apr 30, 05	53491.363	11.330	11.199	9.861	–	G2
May 20, 05	53511.370	11.253	11.108	9.773	–	G2
May 25, 05	53516.390	11.259	11.187	9.814	-0.478	SP
May 26, 05	53517.350	11.247	11.218	9.798	-0.617	SP
Jun 3, 05	53525.448	11.286	11.168	9.792	-0.615	SP
Jul 29, 05	53581.448	9.411	10.260	9.319	–	G2
Jul 29, 05	53581.376	9.394	10.293	9.294	-1.048	SP
Aug 20, 05	53603.327	9.551	10.251	9.305	–	G2
Sep 7, 05	53621.308	9.540	10.316	9.346	-1.081	SP
Sep 15, 05	53629.363	9.323	10.194	9.170	-1.214	SP
Oct 6, 05	53650.355	9.601	10.420	9.418	-1.012	SP
Oct 7, 05	53651.233	9.540	10.343	9.409	-1.053	SP
Oct 9, 05	53653.230	9.541	10.311	9.367	-1.149	SP
Oct 22, 05	53666.276	9.698	10.495	9.497	-0.960	SP
Oct 29, 05	53673.246	9.784	10.530	9.522	-0.979	SP
Oct 30, 05	53673.666	9.808	10.495	9.521	-0.987	SP
Jan 8, 06	53743.601	10.775	10.933	9.707	-0.752	SP
Jan 9, 06	53744.561	10.842	10.983	9.691	-0.774	SP
Jan 17, 06	53753.377	11.015	10.955	9.697	-0.735	SP
Jan 27, 06	53763.395	10.893	10.978	9.724	-0.732	SP
Jan 29, 06	53765.398	10.948	10.967	9.683	-0.753	SP
Apr 7, 06	53833.324	10.939	10.988	9.693	-0.773	SP
May 11, 06	53867.376	10.682	11.016	9.777	-0.694	SP
Jul 4, 06	53921.434	9.970	10.455	9.275	-1.008	SP
Jul 11, 06	53928.410	9.145	9.689	9.038	–	G2
Jul 18, 06	53935.373	8.891	9.373	8.843	-1.314	SP
Jul 19, 06	53936.428	8.841	9.338	8.814	-1.331	SP
Jul 23, 06	53940.371	8.808	9.331	8.764	–	G2
Jul 28, 06	53945.366	8.539	9.144	8.642	-1.465	SP
Aug 11, 06	53959.491	8.339	9.103	8.645	-1.514	SP
Aug 15, 06	53963.319	8.225	9.071	8.596	–	G2
Sep 4, 06	53983.285	8.024	8.873	8.450	–	G2
Sep 10, 06	53989.320	8.090	8.858	8.434	-1.657	SP

Table 10 Continued

Date	JD 24...	U	B	V	ΔR_C	Obs
Sep 12, 06	53991.451	8.137	8.965	8.514	-1.595	SP
Sep 14, 06	53993.258	7.988	8.921	8.515	–	G2
Sep 22, 06	54001.381	8.034	8.824	8.431	-1.644	SP
Sep 23, 06	54002.364	8.124	8.926	8.476	-1.582	SP
Sep 25, 06	54004.473	7.705	8.863	8.403	-1.630	SP
Sep 28, 06	54007.469	8.179	8.989	8.541	-1.598	SP
Oct 17, 06	54026.397	8.249	9.065	8.596	-1.486	SP
Oct 25, 06	54034.366	8.241	9.045	8.625	-1.492	SP
Oct 26, 06	54035.335	8.205	9.012	8.566	-1.511	SP
Nov 17, 06	54056.521	8.429	9.327	8.800	-1.377	SP
Nov 17, 06	54057.437	8.426	9.287	8.724	-1.478	SP
Dec 1, 06	54071.468	8.378	9.205	8.738	-1.389	SP
Dec 20, 06	54089.502	8.532	9.345	8.793	-1.314	SP
Dec 24, 06	54093.543	8.554	9.391	8.872	-1.269	SP
Dec 26, 06	54096.342	8.578	9.555	8.965	–	G2
Jan 15, 07	54116.352	9.084	9.794	9.223	-0.990	SP
Feb 14, 07	54146.466	9.008	9.804	9.148	-1.071	SP

Table 11 CCD B, V, R_C, I_C observations of AG Dra. Indices a and b denote the used comparison stars (Sect. 4.9)

Date	JD 24...	B	V	ΔR_C	ΔI_C	Obs
Mar 3, 05	53432.504	11.338	9.883	-0.945	-1.454	G1^a
May 21, 05	53512.335	11.287	9.788	-1.197	-1.562	G1^a
May 25, 05	53516.338	11.306	9.782	-1.811	-2.128	G1^b
May 26, 05	53517.337	11.306	9.769	-1.825	-2.141	G1^b
Jul 20, 05	53572.422	–	–	-2.184	-2.508	G1^b
Jul 24, 05	53576.335	10.375	9.311	-2.140	-2.435	G1^b
Jul 27, 05	53579.367	10.333	9.276	-2.214	-2.465	G1^b
Aug 11, 05	53594.315	10.347	9.281	-2.269	-2.479	G1^b
Sep 23, 05	53637.303	10.475	9.365	-2.223	-2.420	G1^b
Jan 27, 06	53763.329	11.069	9.676	-1.925	-2.202	G1^b
Apr 8, 06	53833.566	11.099	9.701	–	-2.131	G1^b
Apr 21, 06	53847.291	11.046	9.657	-1.890	-2.146	G1^b
May 19, 06	53875.445	11.141	9.750	-1.854	-2.121	G1^b
Jun 14, 06	53901.398	10.959	9.626	-1.933	-2.196	G1^b
Jul 24, 06	53941.340	9.314	8.741	-2.589	-2.717	G1^b
Aug 19, 06	53967.409	9.091	8.548	-2.644	-2.776	G1^b

Table 12 B, V, R_C, I_C observations of Draco C-1

Date	JD 24...	B	V	R_C	I_C	Obs
Feb 17, 01	51957.626	–	17.12	–	–	R 0.5-m
Mar 24, 01	51993.464	18.084	17.043	16.311	15.650	R 2-m
Mar 05, 02	52339.514	18.695	17.233	16.475	15.823	R 2-m
Feb 28, 03	52698.524	18.677	17.232	16.456	15,821	R 2-m
Mar 02, 03	52700.515	18.637	17.185	16.453	15.827	R 2-m
Mar 02, 03	52701.464	18.620	17.206	16.443	15.860	R 2-m
Apr 02, 03	52732.499	–	17.19	16.33	15.68	R 0.5-m
Mar 12, 05	53442.474	18.619	17.133	16.341	15.679	R 2-m

Table 13 U, B, V observations of RW Hya

Date	JD 24...	U	B	V	Obs
Apr 22, 04	53118.377	10.401	10.275	8.802	SAAO
Apr 23, 04	53119.362	10.404	10.279	8.811	SAAO
Apr 26, 04	53122.406	10.427	10.298	8.829	SAAO
May 02, 04	53128.277	10.370	10.258	8.805	SAAO

Table 14 *U*, *B*, *V* observations of SY Mus

Date	JD 24...	*U*	*B*	*V*	Obs
Apr 22, 04	53118.304	11.433	12.045	10.765	SAAO
Apr 22, 04	53118.305	11.434	12.058	10.762	SAAO
Apr 22, 04	53118.308	11.419	12.055	10.769	SAAO
Apr 22, 04	53118.309	11.425	12.045	10.763	SAAO
Apr 22, 04	53118.317	11.455	12.124	10.808	SAAO
Apr 22, 04	53118.318	11.439	12.135	10.816	SAAO
Apr 23, 04	53119.339	11.448	12.048	10.758	SAAO
Apr 23, 04	53119.339	11.429	12.065	10.751	SAAO
Apr 23, 04	53119.340	11.465	12.064	10.750	SAAO
Apr 23, 04	53119.341	11.464	12.055	10.760	SAAO
Apr 23, 04	53119.346	11.459	12.050	10.751	SAAO
Apr 23, 04	53119.347	11.453	12.057	10.750	SAAO

Table 15 *U*, *B*, *V* observations of AR Pav

Date	JD 24...	*U*	*B*	*V*	Obs
Apr 23, 04	53118.549	11.144	11.710	11.004	SAAO
Apr 23, 04	53118.554	11.147	11.720	10.995	SAAO
Apr 23, 04	53118.557	11.151	11.729	10.996	SAAO
Apr 24, 04	53119.637	11.213	11.757	11.015	SAAO
Apr 24, 04	53119.637	11.214	11.742	11.005	SAAO
Apr 24, 04	53119.644	11.167	11.728	10.994	SAAO
Apr 24, 04	53119.645	11.165	11.720	10.988	SAAO
Apr 27, 04	53122.641	11.196	11.767	11.038	SAAO
Apr 27, 04	53122.647	11.178	11.742	11.010	SAAO
May 3, 04	53128.657	11.184	11.793	11.066	SAAO
May 3, 04	53128.662	11.192	11.765	11.025	SAAO
Sep 7, 05	53621.323	11.805	12.102	11.455	SAAO
Sep 7, 05	53621.329	11.808	12.157	11.484	SAAO
Sep 7, 05	53621.334	11.804	12.137	11.480	SAAO
Sep 9, 05	53623.299	11.870	12.187	11.540	SAAO
Sep 9, 05	53623.304	11.924	12.271	11.619	SAAO

Table 16 U, B, V, R_C observations of AG Peg

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 8, 03	52952.301	9.972	10.154	8.993	–	G2
Dec 8, 03	52982.175	9.981	10.187	9.038	–	G2
Dec 25, 03	52999.215	9.922	10.092	8.901	–	G2
Jan 6, 04	53011.211	9.932	10.082	8.915	–	G2
Aug 17, 04	53235.449	8.956	9.638	8.501	–	G2
Sep 2, 04	53251.468	9.039	9.592	8.437	-0.213	SP
Sep 10, 04	53259.434	8.917	9.557	8.446	-0.211	SP
Sep 17, 04	53266.368	8.865	9.590	8.460	–	G2
Oct 24, 04	53303.428	8.775	9.517	8.366	-0.304	SP
Dec 4, 04	53344.311	8.891	9.502	8.368	-0.281	SP
Dec 11, 04	53351.250	8.781	9.580	8.440	–	G2
Dec 22, 04	53362.195	8.890	9.492	8.380	-0.281	SP
May 21, 05	53511.530	9.731	9.846	8.566	–	G2
May 27, 05	53517.510	9.817	9.826	8.571	-0.031	SP
Jul 30, 05	53581.509	9.976	9.987	8.714	–	G2
Aug 20, 05	53603.443	10.001	10.075	8.815	–	G2
Sep 25, 05	53639.496	10.258	10.192	8.921	0.272	SP
Oct 9, 05	53653.404	10.299	10.265	9.012	0.372	SP
Oct 22, 05	53666.434	10.297	10.227	8.976	0.318	SP
Nov 4, 05	53679.316	10.410	10.237	8.906	0.306	SP
Dec 4, 05	53709.230	10.298	10.261	8.979	0.303	SP
Dec 19, 05	53724.225	10.331	10.289	8.964	–	G2
Jan 7, 06	53743.245	10.585	10.244	8.881	0.311	SP
Jan 10, 06	53746.216	10.234	10.165	8.794	–	G2
Jan 17, 06	53753.193	10.399	10.136	8.755	0.151	SP
Jul 3, 06	53920.499	9.309	9.766	8.529	–	G2
Jul 6, 06	53923.469	9.242	9.729	8.510	-0.128	SP
Jul 11, 06	53928.471	9.241	9.744	8.520	–	G2
Jul 19, 06	53935.549	9.281	9.710	8.496	-0.134	SP
Jul 29, 06	53945.556	9.183	9.627	8.468	-0.115	SP
Sep 10, 06	53989.399	9.136	9.639	8.479	-0.178	SP
Sep 22, 06	54001.424	9.055	9.636	8.476	-0.180	SP
Sep 25, 06	54004.254	9.071	9.628	8.465	-0.185	SP
Oct 17, 06	54026.468	8.997	9.590	8.480	-0.180	SP
Oct 25, 06	54034.292	9.039	9.608	8.492	-0.163	SP
Nov 16, 06	54056.276	8.974	9.588	8.470	-0.190	SP
Nov 17, 06	54057.183	8.994	9.605	8.508	-0.156	SP
Dec 1, 06	54071.227	9.034	9.651	8.595	-0.092	SP
Dec 19, 06	54089.311	9.086	9.683	8.574	-0.099	SP
Dec 30, 06	54100.205	9.090	9.722	8.644	-0.057	SP

Table 17 U, B, V, R_C observations of AX Per.

Date	JD 24...	U	B	V	ΔR_C	Obs
Nov 8, 03	52952.328	12.849	13.350	12.027	–	G2
Dec 8, 03	52982.326	12.841	13.359	11.906	–	G2
Dec 25, 03	52999.312	13.156	13.234	11.744	–	G2
Jan 6, 04	53011.259	13.203	13.119	11.705	–	G2
Jan 14, 04	53019.498	13.108	13.172	11.733	3.490	SP
Feb 11, 04	53047.206	–	12.970	11.730	–	R
Feb 21, 04	53057.284	13.075	13.117	11.651	–	G2
Mar 12, 04	53077.327	13.005	13.020	11.626	3.421	SP
Apr 1, 04	53097.282	12.960	12.992	11.537	3.354	SP
Aug 18, 04	53235.531	11.978	12.640	11.412	–	G2
Sep 3, 04	53251.591	12.097	12.732	11.528	3.309	SP
Sep 11, 04	53259.548	11.993	–	11.508	3.2	SP
Sep 14, 04	53262.605	11.983	12.640	11.552	3.274	SP
Sep 18, 04	53266.529	11.922	12.682	11.564	–	G2
Oct 5, 04	53283.614	11.914	12.426	11.354	3.127	SP
Oct 25, 04	53303.545	11.892	12.569	11.495	3.170	SP
Nov 18, 04	53328.389	–	12.490	11.510	–	R
Nov 20, 04	53330.426	–	12.500	11.490	–	R
Dec 4, 04	53344.473	11.838	12.470	11.327	3.030	SP
Dec 10, 04	53350.328	–	12.390	11.360	–	R
Dec 16, 04	53355.577	–	12.521	11.414	3.073	SP
Dec 21, 04	53361.340	11.896	12.578	11.374	3.077	SP
Feb 6, 05	53408.297	11.979	12.595	11.410	–	G2
Mar 19, 05	53449.287	12.258	12.681	11.362	–	G2
Mar 28, 05	53458.281	–	–	11.347	3.129	SP
Apr 1, 05	53462.280	12.536	12.801	11.387	–	G2
Jul 30, 05	53581.541	–	13.161	11.884	–	G2
Aug 21, 05	53603.501	–	–	11.889	–	G2
Oct 10, 05	53653.523	13.003	13.103	11.746	3.446	SP
Oct 23, 05	53666.555	13.006	13.246	–	3.680	SP
Oct 30, 05	53673.575	13.150	13.085	11.733	3.454	SP
Jan 7, 06	53743.486	12.751	12.845	11.442	3.221	SP
Jan 9, 06	53744.516	12.790	12.910	11.408	3.278	SP
Jan 10, 06	53746.295	12.630	12.836	11.452	–	G2
Jan 17, 06	53753.328	12.645	12.702	11.303	3.140	SP
Jan 27, 06	53763.296	12.574	12.776	11.441	3.281	SP
Jan 29, 06	53765.347	12.480	12.734	11.407	3.205	SP
Apr 8, 06	53833.537	12.160	12.620	11.351	3.156	SP
Jul 4, 06	53920.510	11.963	12.596	11.499	–	G2
Jul 5, 06	53921.507	11.999	12.583	11.474	3.164	SP
Jul 11, 06	53928.498	11.959	12.647	11.537	–	G2
Jul 19, 06	53936.493	12.020	12.567	11.460	3.139	SP
Sep 11, 06	53989.567	11.930	12.506	11.267	2.973	SP
Sep 13, 06	53991.596	11.936	12.432	11.251	2.945	SP
Sep 23, 06	54001.533	12.017	12.411	11.210	2.983	SP
Sep 26, 06	54004.523	12.001	12.383	11.200	2.940	SP
Oct 18, 06	54026.652	12.003	12.447	11.247	3.022	SP
Oct 25, 06	54034.491	11.983	12.452	11.272	3.003	SP
Nov 16, 06	54056.439	11.992	12.438	11.188	2.947	SP
Nov 17, 06	54057.482	12.081	12.514	11.321	3.214	SP
Dec 1, 06	54071.433	11.926	12.501	11.225	2.990	SP
Dec 18, 06	54088.457	12.007	12.432	11.217	2.966	SP
Dec 19, 06	54089.469	12.060	12.555	11.338	3.027	SP
Dec 26, 06	54096.318	11.825	12.468	11.292	–	G2
Jan 15, 07	54116.310	11.972	12.511	11.297	3.018	SP
Feb 11, 07	54143.315	12.180	12.660	11.420	3.098	SP

Table 18 *B* and *V* CCD observations of AX Per.

Date	JD 24...	*B*	*V*	Obs
Sep 21, 03	52903.617	13.103	11.791	G1
Sep 21, 03	52903.640	13.093	11.805	G1
Oct 12, 03	52925.472	13.290	11.949	G1
Dec 2, 03	52976.292	13.246	11.788	G1
Dec 8, 03	52982.376	13.253	11.677	G1
Aug 9, 04	53226.589	12.601	11.462	G1
Aug 20, 04	53237.579	12.555	11.386	G1
Aug 20, 04	53237.595	12.552	11.390	G1
Aug 30, 04	53247.509	12.584	11.423	G1
Sep 19, 04	53268.393	12.594	11.502	G1
Oct 6, 04	53284.539	12.534	11.472	G1
Oct 11, 04	53290.479	12.534	11.507	G1
Oct 21, 04	53300.404	12.550	11.561	G1
Nov 4, 04	53314.375	12.498	11.467	G1
Dec 5, 04	53345.177	12.437	11.353	G1
Dec 22, 04	53362.166	12.517	11.499	G1
Jan 10, 05	53381.349	12.475	11.341	G1
Jan 16, 05	53387.283	12.419	–	G1
Feb 4, 05	53406.259	12.556	11.434	G1
Mar 3, 05	53433.235	12.566	11.328	G1
Jul 20, 05	53572.448	13.198	11.892	G1
Aug 12, 05	53594.510	13.252	12.041	G1
Aug 14, 05	53596.509	13.238	12.022	G1
Sep 6, 05	53619.529	13.160	11.890	G1
Sep 8, 05	53622.444	13.156	11.855	G1
Oct 5, 05	53648.580	13.107	11.701	G1
Oct 5, 05	53648.616	13.114	11.707	G1
Oct 7, 05	53650.508	13.106	11.695	G1
Dec 19, 05	53724.303	12.894	11.508	G1
Jan 27, 06	53763.302	12.735	11.377	G1
Feb 2, 06	53769.264	12.754	11.449	G1